

KNOWLEDGE

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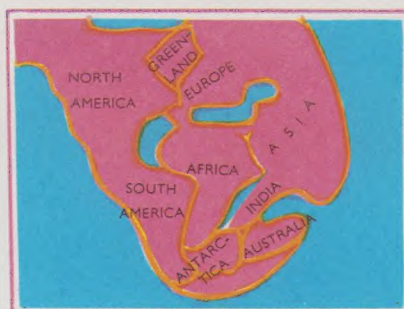
Editor: William Armstrong, B.A.; Assistant Editor: Christopher Falkus, B.A.

G GEOLOGICAL ERAS

HOW old is the earth? That we will never know exactly, but for geologists, men who study the structure of rocks and fossils, its history goes back 5,000,000,000 years, and man has only been on the earth about $\frac{1}{5000}$ of this time. If you were to regard the known history of the earth as a day, then man would have been on it for less than 20 seconds. But great reptiles like dinosaurs would have been at large for less than 40 minutes! Dinosaurs would have appeared at around 11 p.m. and disappeared over half-an-hour later. But let us pursue this idea further. The world would have been completely without life for no less than 10 hours until the first minute algae evolved at about 10 a.m. and primitive molluscs would have been putting in their appearance only at about 9.30 p.m.

GEOLOGICAL PERIODS
 Geologists divide the history of the earth into eras and periods. They are not in agreement about the method of division nor about the dates. The system given here is one in common use; for another see *Geology: part two*.
 (Lengths in millions of years)

Neozoic Era	
Present day to 0.025	Holocene
0.025 to 1	Pleistocene
Cenozoic Era	
1 to 15	Pliocene
15 to 35	Miocene
35 to 50	Oligocene
50 to 70	Eocene
Mesozoic Era	
70 to 120	Cretaceous
120 to 150	Jurassic
150 to 190	Triassic
Palaeozoic Era	
190 to 220	Permian
220 to 280	Carboniferous
280 to 320	Devonian
320 to 350	Silurian
350 to 400	Ordovician
400 to 500	Cambrian
Eozoic Era	
Older than 500	{ Algonkian Archean



Probable distribution of the continents at the end of the Eozoic Era



Simple forms of life in the Eozoic seas

PALAEOZOIC ERA (from the Greek *palaios*, ancient, and *zoe*, life)

Living things, as shown by fossils, first appeared in large numbers during the Palaeozoic or Primary Era. **Duration:** 310 million years.

Periods:

Cambrian (500 m ago) – from Cambria, an ancient name given to the western part of Wales.
Ordovician (400 m) – from the name of an ancient tribe in the central part of Wales.
Silurian (350 m) – from the name of an ancient tribe in the Shropshire-Welsh borderland.
Devonian (320 m) – from the county of Devon where rocks of this date appear.
Carboniferous (280 m) – indicating the abundance of coal in these rocks.
Permian (220 m) – from the district of Perm in northern Russia.

The first three periods form the Lower and the last three the Upper Palaeozoic.

Geographical distribution: This era was interrupted by a period of mountain building when the rocks of the Lower Palaeozoic were folded to form the Caledonian Mountains in Wales, Scotland, and Norway. The Upper Palaeozoic rocks were folded by the Armorican folding which produced the hills of the Pennines and South Wales. Both Upper and Lower Palaeozoic rocks are formed of thick sandstones and shales. Limestones become more common in the Upper Palaeozoic, and the Carboniferous period is noted for its coal deposits.

Flora and fauna:

From Cambrian to Silurian times many species of marine invertebrates such as trilobites, graptolites, molluscs, and corals appear. The trilobites show considerable evolution throughout this time, eventually dying out in the Carboniferous. Graptolites first appear in the Ordovician, and are not seen again after the end of the Silurian. Primitive fishes and land plants first appear in the Silurian and become important fossils in the Devonian period when the first amphibians evolved. During



Distribution of land and sea in the Devonian Period

Previous page: A moonlit view of the earth at the end of the Mesozoic Era. In the foreground: left, a stegosaurus; right, a tyrannosaurus; flying, pteranodons (winged reptiles).



African tribesmen stalking a group of impala; their weapons are bows and poisoned arrows

TWO centuries ago in the extreme south of Africa a large and beautiful animal called the bluebuck was very common. When South Africa was colonised the animals of this region were hunted without mercy or restraint, and by 1799 the bluebuck was extinct. There are half a dozen mounted specimens of it in European museums, but no one will ever see a live bluebuck again.

The bluebuck was one of the antelopes, a wonderful variety of which still exists in Africa. Today many of them are threatened with the same fate as the bluebuck. It is easy to blame the past activities of big-game hunters, killing for 'sport', or the African 'poachers' of the present day; but the real trouble is the continual spread of agriculture and other human activities over country formerly only sparsely populated. It is hard to persuade tribesmen that it is wrong to kill animals for food, or in order to prevent them from destroying crops.

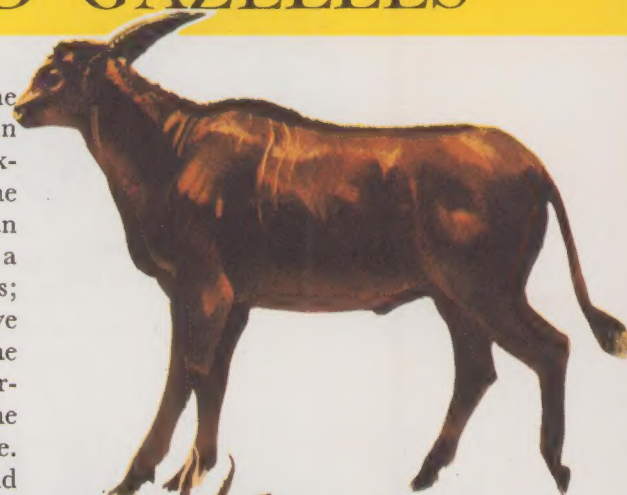
But Africa is a big continent and already large areas have been set aside as game reserves, in which animals can live unmolested. If the animals are to be saved the African people themselves will have to maintain these reserves. Let us hope that they and their leaders will realise this before it is too late.

ANTELOPES AND GAZELLES

Antelopes are by far the most diverse of all the large herbivorous animals. Most of the species live in Africa, a smaller number in Asia, and one kind extends into eastern Europe. In size they range from the eland, which is a heavily built animal the size of an ox, to the little royal antelope, hardly larger than a hare. A few antelopes are grotesque, ugly creatures; among these are the gnus or wildebeestes, which have been described as having the body of a horse with the head of an ox. The saiga antelope is another queer-looking beast, with a bulbous nose; it lives on the steppes of northern Asia and the extreme east of Europe. But most antelopes are beautiful animals, active and graceful and often handsomely marked and coloured. Nearly all of them have horns, which are usually borne by both sexes but may be absent in the female. These horns may be long and straight or slightly curved, as in the several species of oryx, or they may be twisted like gigantic corkscrews, as in the kudu and addax. The horns of gazelles are curved in a shape like a lyre.

The gazelles are a group of small, slender-legged, very active and graceful antelopes. Grant's gazelle and Thomson's gazelle are well-known species found in Kenya and Tanganyika. The impala, which is quite common in southern and eastern Africa, is intermediate between the true gazelles and the other antelopes.

All types of country in Africa are inhabited by antelopes of one kind or another. The gnus and the impala are found in open savannah. The bongo is a rare antelope which lives only in forest, and the marsh antelope or sitatunga inhabits swampy areas and spends much of its time in the water. At the other extreme are the desert antelopes, which include the beautiful dorcas gazelle, found in and around the Sahara Desert, and the addax antelope, which also lives in the Sahara and can go for long periods without water. The klipspringer and rhebok are mountain antelopes; they are active climbers like the European chamois.

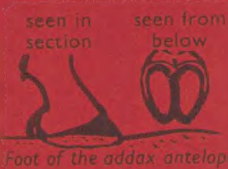


The eland, a large antelope



A small antelope, the isabel-line gazelle

The feet of an addax antelope are adapted for walking in soft sand.



The marsh antelope or sitatunga has feet which are divided and spread out.



ANTELOPES

Giant eland (*Taurotragus derbianus*). This is as big as an ox and the largest of the antelopes.

Bongo (*Booceros euryceros*). This is a rare and handsome species which lives in dense forest.

Addax antelope (*Addax nasomaculatus*). A beautiful animal found in the Sahara Desert.

Impala (*Aepyceros melampus*). One of the most common African antelopes, very fast and capable of prodigious leaps 8 or 9 feet in the air.

CLASSIFICATION

We have already talked about the position of the antelopes in the animal kingdom in our article on the Bovidae (see page 2454). This Family includes cattle, buffaloes, sheep, and goats as well as antelopes, and also the 'goat-antelopes' (for example, the chamois) which are intermediate between antelopes and goats.

Blackbuck (*Antelope cervicapra*). A very fast and active animal that lives on the plains of India. It is hunted with cheetahs.

Note: these animals are not drawn to the same scale.

Gerenuk (*Lithocranius walleri*). This long-necked antelope lives in semi-desert parts of eastern Africa, browsing on the leaves of small trees.

Reedbuck (*Redunca arundinum*). Inhabits grassy plains, usually in the vicinity of water.

Rhebok (*Pelea capreolus*). A South African species living in mountainous country.

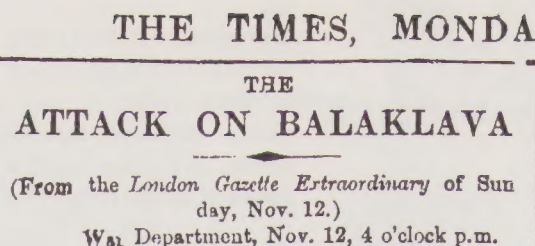
GAZELLES

Dorcas gazelle (*Gazella dorcas*). Widely distributed in and around the Sahara Desert.

Isabelline gazelle (*Gazella dorcas isabella*). A subspecies of the dorcas gazelle found in Ethiopia. It lives in the mountains up to 4,000 feet.

Soemmering's gazelle (*Gazella soemmerringi*). Found in north-eastern Africa.

Grant's gazelle (*Gazella granti*). A large gazelle with very elegant horns.



JOURNALISTIC REVOLUTION



Journalism has progressed from the restraint of The Times to the forthrightness of the Daily Mirror. **Top** (left to right): from an early issue of The Times, January, 1788; from The Times of March 11, 1815; the report of Balaklava on November 13, 1854. **Below** (left and centre): the Daily Mirror of November 2, 1903 – a genteel ladies' newspaper; (right) the Daily Mirror of September 4, 1939

EVERY morning about 15½ million copies of the national daily newspapers are sold in Britain – which means a newspaper for nearly every third person. As well as the national papers there are regional papers (some daily, some weekly), national and regional evening papers, Sunday papers, and papers for specialised minorities. They cater for an enormously wide variety of tastes and interests, and we are inclined to take it for granted that we can buy just the paper to suit our mood.

But newspapers – particularly daily newspapers – are of comparatively recent origin. The first daily newspaper to be published with any regularity for any length of time was the *Daily Courant*, which came into being in March 1702, and had offices near Ludgate Hill. It was a single sheet printed on one side only, and sold for a penny. The first evening newspaper – *The Star* – did not appear until 1788.

Journalists did not really become influential until the 18th century. Swift and Defoe (see page 328), and later in the century Wilkes and his *North Briton*, had a considerable effect on politics. Wilkes was even imprisoned by the government, although later he was released, and the Press's rights to publish parliamentary reports triumphantly confirmed. But the papers such men wrote for only appealed to the small minority who were both educated and radical – the vast majority were not educated enough to read them; their subject matter was too political and localised for a wide appeal; and printing and distribution facilities were limited.

Gathering speed

It was not until the 19th century that the newspapers began to have an effect on all British classes. The Industrial Revolution changed many things in Britain and had a marked effect on the Press. News

travelled very slowly in stage-coach days (the report of the landing of the French troops at Fishguard in 1797 took five days to reach the House of Commons), but with the coming of the railways news began to be rushed at speed from London to all parts of the country. This meant that people could learn in a matter of hours about the latest legislation passed in Parliament, what the Prime Minister was saying about this or that, and the details of a catastrophe or a stirring event.

Industrial Revolution

Communications improved rapidly during the 19th century, not only at home but abroad. The electric telegraph was first used by newspapers in the 1840s, and the first submarine cable between France and England was opened in 1850. The submarine cable to the United States was completed in 1866.

The Industrial Revolution also brought enormous improvements in printing techniques, which enabled both the setting up of type and the actual running off of the papers to be carried out far more quickly. Apart from this mechanical progress, the Press was advancing in another sphere. Industrialisation brought misery in its wake for masses of the working class – but they had champions.

Newspapers began to take up the causes of the people. Charles Dickens's newspaper, *The Daily News*, forerunner of the now defunct *News Chronicle*, was actually founded in 1846 to speed the passing of the repeal of the Corn Laws. It told the story of poverty among the workers and campaigned nobly for better conditions.

At this time *The Times* (founded in 1785) was gradually becoming the voice of Britain. It flayed bad politicians, and one of the first war correspondents, W. H. Russell – a *Times* man – exposed the almost unbelievable mismanagement of the Crimean War campaigns.

The Times editorial has become less outspoken since this account of Bonaparte's escape in 1815

LONDON, SATURDAY,
MARCH 11, 1815.

'Early yesterday morning we received by express, from Dover, the important but lamentable intelligence, of a civil war having been again kindled in France, by that wretch BUONAPARTE, whose life was so impolitically spared by the Allied Sovereigns. It now appears that the hypocritical villain, who, at the time of his cowardly abdication, affected an aversion to the shedding of blood in a civil warfare, has been employed during the whole time of his residence at Elba, in carrying on secret and treasonable intrigues with the tools of his former crimes in France. At length, when his plots were ripe, he sailed from Elba, . . . and we earnestly hope and trust, that ere many posts have elapsed, we shall receive accounts that the arch-traitor has been delivered over to the disgraceful death he has for so long so richly merited.'

Popular approach

By the end of the 1870s compulsory free schooling had arrived, and a few years later a new generation was looking to the newspapers for day-to-day information. What they found did not entirely please them. The newspapers like *The Times* and the *Morning Post* (founded 1772) were too long-winded. What they wanted was a more readable and radical approach – in fact, the radical approach of the 18th century in a down-to-earth, non-intellectual, non-philosophic way.

And that is where a young man called Alfred Harmsworth – later Lord Northcliffe – stepped in. His *Daily Mail* – which he started in 1896 – gave this new public what it demanded. He broke away from the conventional and began presenting news in a form which was readily understood by the masses.

In the first instance he was after young people. He wanted them to know and understand what an exciting world they were living in. He threw dull advertising matter off the front page and substituted stories in bold type and with arresting headlines.

He made reports shorter and brighter, written in plain, straightforward language. He emphasised 'human interest' and the odd or the unusual. He sent his reporters and correspondents to all parts of the world, and they sent back descriptive accounts of people and places which were at once picturesque and interesting. Sport, which was one of the main leisure-time activities of the working man, whether watching or playing, got good news coverage. And, true to the radical tradition, the government was criticised.

This new approach to newspapers snowballed. When Mr Arthur Pearson started the *Daily Express* in 1900 it became plain that the new journalism was here to stay; and the new rapidly began to take over the old. Lord Northcliffe became the owner of *The Times*.

One of the most revolutionary of all newspapers was the *Daily Mirror* – begun by Harmsworth in 1903 as a woman's paper. Harmsworth had seen that women were avid readers and that they would welcome a paper of their own. But the *Mirror* was changed to an illustrated tabloid and soon acquired its lively, sensational, 'publish and be damned' philosophy, and is today one of the liveliest and best-selling newspapers in the world.

In 1911 the *Daily Herald* was founded as an organ of the Labour Party; in 1929 Odhams Press gained a controlling interest in it on the understanding that it would support the policy of the TUC (Trades' Union Congress).

Simultaneously with the rise of the great newspapers came the growth of Fleet Street. What is it about this rather shabby thoroughfare that runs from the Strand to Ludgate Circus

which makes it probably the world's greatest newspaper publishing centre? It is certainly not the street itself. It is the shortest of the dozen or so most famous streets in London and certainly the ugliest. The fact is Fleet Street is symbolic – a place which is newspapers. Its association with newspapers began in the mid-19th century. Before that it was a place famed for its coffee houses and taverns; a haunt of the great conversationalists, writers and politicians of the time. It was always rather a rakish place, and some of this atmosphere has clung to present-day Fleet Street.

It is a place that comes alive when the rest of the city sleeps. The mighty roar of the giant rotary presses begins in the late evenings and goes on through the night – turning out edition after edition of newspapers which are to find their way to the most distant parts of the country by breakfast time. Every night miles and miles of newsprint, thousands of gallons of printing ink, and a tremendous amount of effort from hundreds of workers are put into producing our newspapers. The vans stand ready in the dark streets below the lighted windows of the offices, waiting to rush the wrapped bundles of newspapers to the railway stations for their various journeys to Penzance, Cambridge, Liverpool, or Southampton. It is an exciting place, but an exhausting one too.

Sensationalism

One of the most hectic periods in Fleet Street's history came in the years between the two World Wars. In the 1920s the combined circulations of all the big dailies was less than six million. Then the fight for circulation began in earnest. Rivalry was intense; no quarter was asked or given in the race to be the first with the news, or to have it 'exclusive'.

Promotion experts moved in to think up bigger and bigger competitions with large cash prizes. Readers' insurance was

introduced, and this was followed by the most fantastic free-gift schemes. If one subscribed to this or that newspaper and cut out a certain number at the top of the page the gifts were unlimited – anything from a fountain pen to a motor-mower. Journalists did not like these schemes, but it cannot be denied that they served their purpose. Circulations climbed up and up, and mass circulations became the major aim of the popular newspapers.

Inevitably this led to a lowering of journalistic standards, and Fleet Street heard complaints about the 'Yellow Press'. Newspapers most affected by this circulation drive sacrificed hard, sober news – no matter how interesting – for human interest, and a great deal of 'cheque book journalism' went on. This is so called because people in the news, whether they are self-confessed



Though always an organ of the Labour Party or Labour views, the appearance of the Herald has changed considerably. Top to bottom: the first issue of January 25, 1911; the issue of March 2, 1934, with a much livelier editorial approach and more modern standard of lay-out; the issue of September 4, 1939 – a completely modern look



Northcliffe – founder of popular journalism

criminals or cheap philanderers, are 'bought up' for their exclusive story. It is a pity that this sort of thing is still with us today.

The Press Lords

The inter-war period was the age of Press Lords and potentates. In 1922 Northcliffe died, and the *Daily Mail* passed to his brother, Lord Rothermere, under whose management the Harmsworth empire expanded. There were also the Berry brothers (later Lords Camrose and Kemsley) of the *Daily Telegraph* and *Sunday Times* respectively; and the Astors of *The Times* and *Observer*. In the United States William Randolph Hearst was controlling the world's largest newspaper chain.

One of the best-known of the old school Press Lords, who is still very active, is Lord Beaverbrook, owner of the *Daily Express*, *Sunday Express*, and *Evening Standard*. Beaverbrook was plain Max Aitken when he came to England from Canada. He was then 30 and had already made a fortune. He entered politics and was almost immediately successful, winning a surprising victory at Ashton-under-Lyne in the general election of 1910. The *Daily Express* was ailing badly when he bought it in the middle of the First World War for the surprisingly low sum of £17,500. But he injected into it his boundless enthusiasm and energy. It flourished – and even more so when he appointed a young man called Arthur Christiansen its editor. Christiansen admired Beaverbrook and vice-versa, and the two became a tremendous team. For over a quarter of a century Christiansen led the *Express* to

TITANIC SUNK.

FEARED LOSS
OF
1,500 LIVES.

MESSAGE FROM
OLYMPIC.

675 RESCUED.

CHILDREN AND
WOMEN.

COLLISION WITH
ICEBERG.

Above: one of the most sensational news stories of the 20th century – the wreck of the Titanic. Note the restrained headlines of the *Daily Mail* of April 16, 1912, and the numerous sub-headlines. Nowadays newspapers seldom have more than two sub-headlines.

Below: the *Daily Mail* of November 12, 1918 triumphantly reporting the end of the war. Note the use of sans-serif type and wide headlines

greater and greater heights under 'The Beaver', and it was tragic news indeed for the old Press Lord when he was told recently that Christiansen had died.

Today there are other powerful figures – Cecil King, of the *Daily* and *Sunday Mirror*, is head of the biggest publishing group in the world; there is the forward-



Beaverbrook – adventurous and successful

looking Lord Thomson of the *Sunday Times* and *The Scotsman*; Lord Rothermere, nephew of Lord Northcliffe, of the *Daily Mail* and *Daily Sketch*; and Lord Camrose of the *Daily* and *Sunday Telegraph*.

This then is the extent of the journalistic revolution – from the pompous and long-winded newspapers, and from the radical sheets for the few, there have grown lively, readable, and generally interesting newspapers for the many, some of which have considerable influence in shaping public opinion. There has also been a revolution in the status of the journalist: he has grown into someone whose intelligence, knowledge, and independence are often appreciated, and who is respected as the representative of a powerful institution.

There has been a revolution too in women's journalism – the period since the last war has seen the growth of well-produced women's magazines with circulations in the millions.

Printing is being continually improved. Britain's advanced distribution organisation has made it possible for national newspapers to operate more effectively in Britain than in any other country – in Europe and America newspapers, on the whole, have a much lower circulation because their distribution is local.

But all is not well with some sections of the Press – methods of obtaining news; deliberate slanting, and occasional misrepresentation of the true facts; preoccupation with vice and crime; buying-up of the memoirs of unsavoury people for colossal sums, and so on. But still one of the greatest safeguards of democracy is a free and influential Press – and that we have.

DAY, NOVEMBER 12, 1918.

GERMANY SURRENDERS.

ALLIES TO OCCUPY THE RHINELAND.

FLEET GIVEN UP OR DISARMED.

TO BE HANDED OVER:

ALL U-BOATS.	2,000 AEROPLANES.	ALL ALLIED PRISONERS AND CIVILIANS.
5,000 GUNS.	5,000 LOCOMOTIVES.	150,000 RAILWAY TRUCKS.

WHEN SHALL THEIR GLORY FADE?

HISTORY'S MOST HEROIC DEFENCE ENDS IN TRIUMPH.

THE BOERS' LAST GRIP LOOSENED.

MAFEKING AND BADEN-POWELL'S GALLANT BAND SET FREE.

Top: the Daily Express of May 19, 1900, reporting the end of the siege of Mafeking. **Below:** a 'scoop' in the same issue. **Right:** stop-press news from the Daily Express, April 16, 1912, showing how the news of the Titanic disaster made its way into print. **Bottom:** the 'Beaverbrook revolution' transformed the Express. It became one of the pioneers of lively writing, editing, and lay-out, typified by this issue for August 3, 1934

"LET ME TELL MOTHER."

HOW THE "EXPRESS" FIRST
GAVE THE NEWS

TO BADEN-POWELL'S
HOME.

By an almost incredible piece of good fortune, the happiness fell to a representative of the "Express" of being absolutely the first to take the news of the relief to the home of the gallant colonel's mother and sister, in St. George's place.

This is how it happened.

Immediately the longed-for telegram came along the wire, an "Express" representative dashed off in a hansom to the house, wherein for so many weeks Mrs. and Miss Baden-Powell, the former prostrated with anxiety, the latter wearing over the beautiful smile of hope that refuses to give way, kept weary vigil over the fate and fortune of son and brother.

Our representative found the house dark and silent, but in the street outside there was the ever present little knot of people looking at nothing in particular, but fascinated at the sight of the mere bricks and mortar, within which dwelt all that Baden-Powell holds most dear in the world.

Knocking at the door, the representative of the "Express" was informed that a strict rule had been made to receive no callers.

"But," exclaimed the representative, perhaps a little excitedly, "do you know that Mafeking is relieved?"

"Mafeking relieved!" echoed the servant, rushing indoors.

And then in an instant there appeared the fragile, fair form of Miss Baden-Powell, not in the least hurried, and obviously incredulous.

"My mother is ill," she said—"and is it really true?"

"Quite true."

"We have heard nothing from the War Office, and we have heard so many rumours that we can hardly believe anything now."

"But indeed it is true; it is all over London—everywhere apparently except here. Fleet-street is screaming with delight, and all along the Strand the people are cheering in great crowds."

At this moment a distant roar came down the street from Hyde Park Corner. "There they are!" exclaimed our representative, as the roar drew nearer. And presently a cry was heard: "Light up the illuminations!"

This referred to the gas-lights which had already been placed in position in the front of the house, but which, of course, were as yet unlighted.

"Let me tell my mother! I will go and have the lights put on," said Miss Baden-Powell.

Then she burst into tears.

STOP-PRESS NEWS

TITANIC SINKS.

New York, Monday, April 15.

The Titanic sank at 2.20 this morning.

No lives were lost.—Reuter.

MANY LIVES LOST.

New York, Monday, April 15

The White Star officials now admit that many lives have been lost.—Reuter.

675 SURVIVORS.

New York, Monday, April 15 (8.45 p.m.)

The following despatch has been received from Cape Race:—

The steamer Olympic reports that the steamer Carpathia reached the Titanic's position at daybreak, but found boats and wreckage only.

She reported that the Titanic foundered about 2.20 a.m. in Lat. 41., Deg. 16 mins., Long 50, Deg. 14 mins. The message adds:—

All the Titanic's boats are accounted for. About 675 souls have been saved of the crew and passengers. The latter are nearly all women and children.

The Leyland liner California is remaining and searching the vicinity of the disaster. The Carpathia is returning to New York with the survivors.

OFFICIAL STATEMENT.

New York, Monday, April 15.

8.20 p.m.

The following statement has been given out by the White Star officials:—

"Captain Haddock, of the Olympic, sends a wireless message that the Titanic sank at 2.20 a.m. Monday, after all the passengers and crew had been lowered into lifeboats and transferred to the Virginian.

"The steamer Carpathia, with several hundred passengers from the Titanic, is now on her way to New York."—Reuter.

DAILY EXPRESS PHOTO. 1900 & 1934.

Bank Holidays
Are jolly days—in
Beaer Brand
CHERRY LUXURY STOCKINGS

Daily Express

Today's Weather: Unsettled.

Radio Programmes: Page Thirteen.

NO. 10,690.

FRIDAY, AUGUST 3, 1934.

ONE PENNY.



LOST 6st. 2lbs.
The following notice is published in the Daily Express for the purpose of enabling the owner to recover the same. The notice is published in the Daily Express for the purpose of enabling the owner to recover the same. The notice is published in the Daily Express for the purpose of enabling the owner to recover the same.

PRESIDENT—CHANCELLOR HITLER

HE CAN ONLY
BE DEPOSED
BY HIMSELF

DECREE ISSUED AFTER
HINDENBURG'S DEATH
THE KING'S MESSAGE

PAUL VON HINDENBURG, Field Marshal and President of the German Reich, is lying on his bed at Castle Neudeck, East Prussia, majestic in death as in life.
Four Reichswehr soldiers are standing at attention at the corners of the bed. Black candles give a flickering light in the darkened room.
Today the body will be placed in a coffin which will also have a guard of honour until the burial in Neudeck, probably on Monday.



Daily Express PROGRESS REPORT

1.—The net sale of the "Daily Express" for the month of July was in excess of

1,785,000 Copies Per Day

an advance of 10,000 copies per day over the average daily net sale for the month of June.

This is a record in net sale, excluding a short period when the "Daily Express" demonstrated by free gifts and money competitions that the unsound methods of other newspapers could be emulated and surpassed.

2.—The advertising revenue of the "Daily Express" has never been so satisfactory.

3.—The "Daily Express" has no bonds and no mortgages.

4.—The "Daily Express" is the only big newspaper in this country free from bonds or mortgages.

5.—Seventy-eight per cent. of the Ordinary share capital of the "Daily Express" is owned by Lord Beaverbrook, his family, and colleagues on the staff of the newspaper.

6.—The "Daily Express" is the world's greatest newspaper.

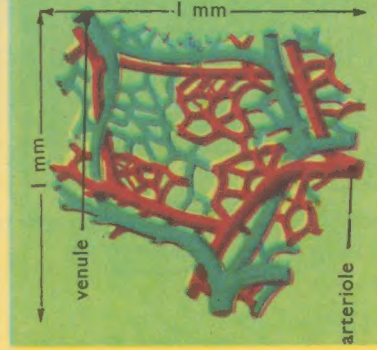


WEDDING of Lord Alton and Mrs. Beatrice Alton. The wedding took place yesterday at the Alton Hotel, London. It was a most brilliant affair, and the ceremony was attended by many guests.

THE CIRCULATORY SYSTEM

THE circulatory system acts as a 'highway' along which materials are transported from one part of the body to another. This 'highway' carries oxygen-laden blood from the lungs to the tissues in all parts of the body, and simultaneously, but in the opposite direction, it carries carbon dioxide away from the tissues for elimination in the lungs. It transports nutrient substances from the intestines and the liver, waste products from the tissues, and protective white cells and antibodies, hormones, and sometimes even medicine.

The arteries, capillaries, and veins of the circulatory system form an endless circuit around which the blood is pumped continuously by the beating of the heart. The left side of the heart pumps blood through the arteries to every part of the body except the lungs. The blood passes through capillaries in the tissues and returns along the veins to the right side of the heart. This part of the circuit is often called the *systemic circulation* to distinguish it from the *pulmonary circulation* in which the blood flows from the right side of the heart, through the lungs, and back to the left side of the heart.



In the large illustration of the circulatory system it is not possible to show all the small blood vessels, nor the minute capillaries through which the blood flows from the arteries into the capillary bed, however, shows how the vessels are arranged.

A diagram showing how blood flows from the arterioles through the capillary bed into the venules

THE SYSTEMIC CIRCULATION

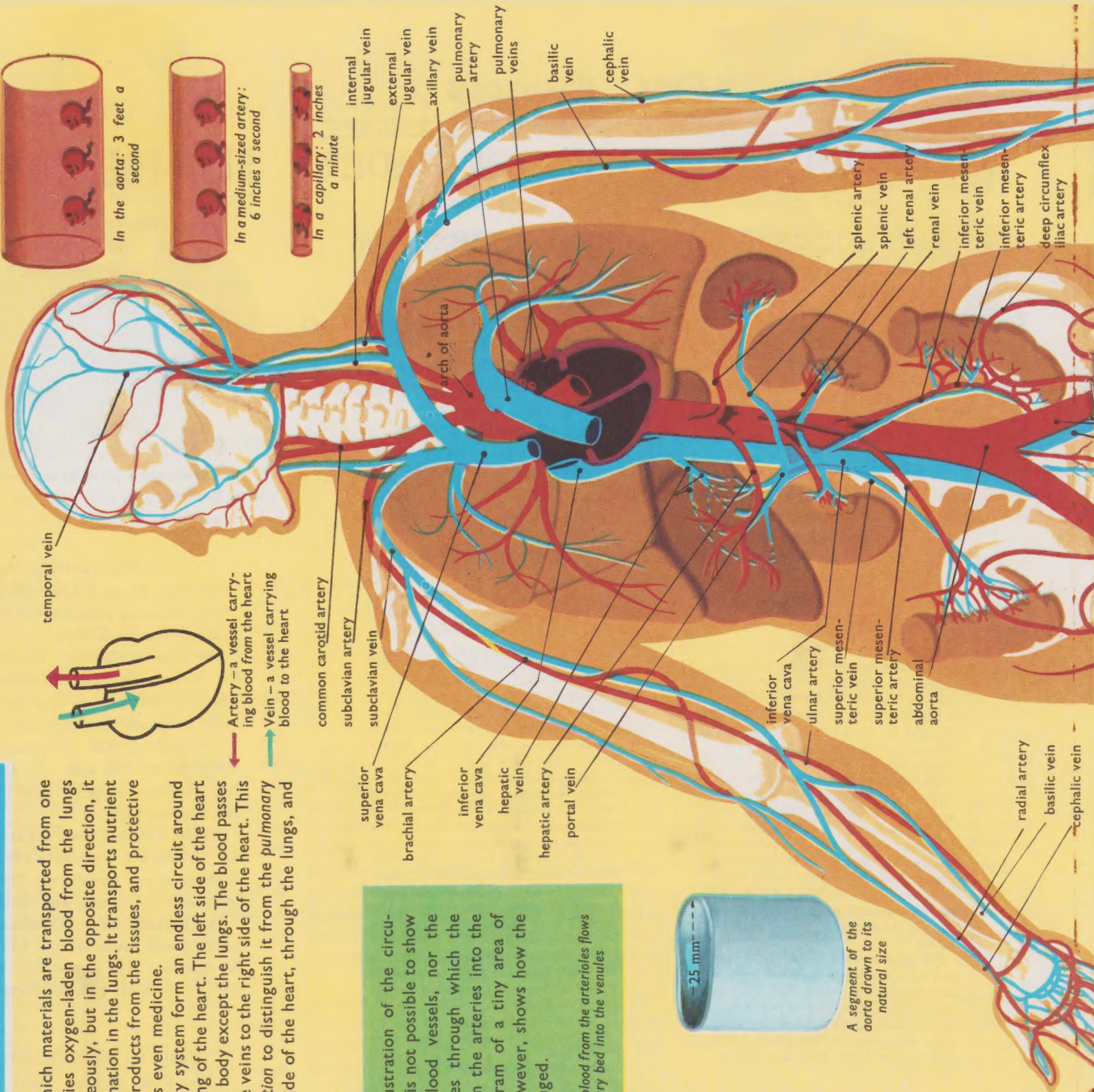
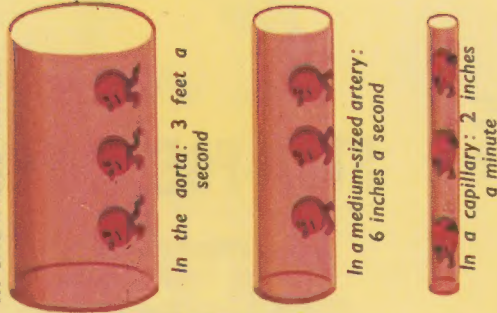
The arteries. With each beat of the heart approximately 60 millilitres of oxygen-laden blood are pumped out of the left ventricle into the largest artery in the body, the *ascending aorta*. A little of this 'surge' of blood immediately leaves the aorta and flows back to the heart in two medium-sized arteries. These are the *coronary arteries* which traverse the heart muscle and supply it with blood.

From the second part of the aorta, the *arch*, three much larger arteries arise. One is the *innominate artery* which soon divides into the *right carotid* and *right subclavian arteries*, supplying the right side of the head and the right arm. The others are the *left carotid artery* which supplies the left side of the head, and the *left subclavian artery* which supplies the left arm.

No large arteries branch off the aorta as it descends through the chest, but from the *abdominal aorta* two most important vessels arise. These are

THE COURSES OF THE IMPORTANT BLOOD VESSELS OF THE HUMAN CIRCULATORY SYSTEM

The rate of blood flow in the blood vessels



A segment of the aorta drawn to its natural size

the *mesenteric arteries* which supply the intestine. Finally the aorta splits at its lowest end to form the two *common iliac arteries* which supply the pelvis and the legs.

As the arteries in the various parts of the body get farther and farther away from the heart their size steadily diminishes. Finally each divides into a number of minute *arterioles* which carry the blood to the *capillaries*. In these capillaries oxygen and nutrients escape from the blood and pass into the tissues. It is here, too, that unwanted carbon dioxide and nitrogenous waste substances escape from the tissues and enter the blood.

The veins. The blood in the capillaries collects into tiny *venules* which quickly merge with each other to form larger veins. In these veins the blood flows towards the heart.

The veins which collect the blood from the head, neck, and arms carry it into a short but very wide vessel called the *superior vena cava*. This great vein leads into the right auricle of the heart. The blood from the lower limbs is collected into the two *common iliac veins* which unite to form the *inferior vena cava*. This vessel carries the blood upwards until it enters the right auricle.

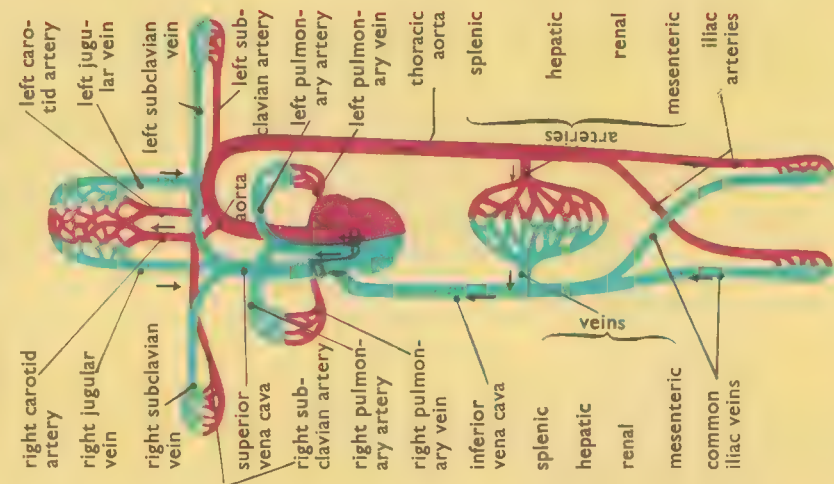
The portal system. The veins which convey blood from the intestines and from the spleen form a rather special arrangement known as the *portal system*. The two *mesenteric veins* and the *splenic vein* unite to form the *portal vein* which takes the blood to the liver. This arrangement ensures that the food substances collected from the intestine by the mesenteric veins are carried to the liver for use or storage.

In the liver the portal vein breaks up and the blood that it carries flows throughout the whole organ. It is then collected into the *hepatic vein* which leads into the inferior vena cava.

THE PULMONARY CIRCULATION

The blood which enters the right auricle is blue-red in colour, for it carries little oxygen. It does, however, contain a large amount of carbon dioxide. This blood flows out of the auricle into the ventricle and is immediately pumped into the *pulmonary artery*, the only artery in the body to contain venous blood. When this blood reaches the lungs it quickly gives off its carbon dioxide and takes up oxygen, becoming red again in the process. It returns fully oxygenated along the pulmonary vein to the left auricle. From the auricle it flows into the left ventricle and is pumped around the circulatory system once again.

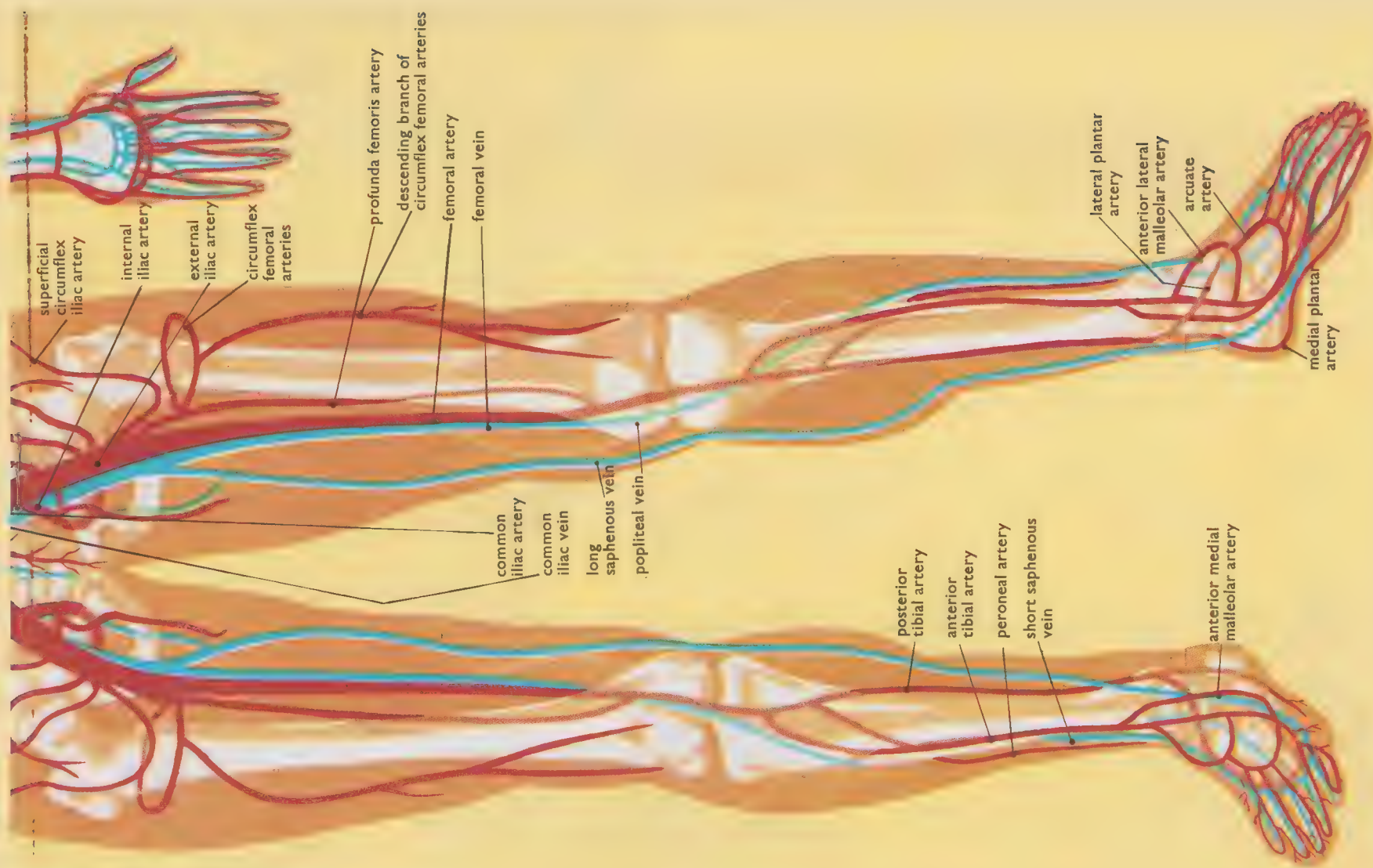
A DIAGRAM OF THE CIRCULATION



CIRCULATION

The volume of blood which passes around the circulatory system each minute does not remain constant but varies with bodily activity. During vigorous exercise, for example, the heart beats faster and its output increases. Much of this extra blood passes to the muscles and so provides them with the large amounts of oxygen they need for their activity.

The flow of blood in each organ is controlled by the arterioles. When an organ is active the arterioles dilate and allow large amounts of blood to flow out of the arteries and into the capillaries. When an organ is at rest the arterioles contract and thus the blood flow is reduced.



ECONOMY OF POLAND

AFTER the Second World War the new Communist government set about transforming the Polish economy. It had been backward and largely geared to peasant agriculture, and had been severely damaged by the war. Today the situation is different. Modernisation has been rapid; industry has grown fast; agricultural production has also increased, though less quickly; and living standards have risen. Poland has indeed come a long way since the bleak years immediately following the war.

Planning and problems

The Communist government owns by far the larger part of industry, and so it has been able to plan the economy as a whole by setting targets for the various sectors of the economy. Those it considers important it can help, those it considers less important it leaves alone. Although the state owns most of industry, over 80 per cent of agricultural land is still privately owned, and this is the main reason why the government's targets for agriculture have been less successfully met than those for industry. Because of disappointing agricultural yields, Poland is forced to import some foodstuffs, including wheat.

Poland's economy is helped by her central position between the growing economies of the Soviet Union and of central and western Europe. Great rivers and a wide network of railways and canals help internal communications, while in the north Poland has an outlet to the Baltic Sea through such ports as Kolberg, Gdynia, and Danzig (Gdansk).

A Polish woman in her colourful traditional costume



MINERAL RESOURCES

Mineral resources form the basis for Poland's industries. Coal provides both steam and electric power, while iron ore feeds the iron and steel industries. Indeed Poland has a wealth of mineral resources, among which are some of the richest coalfields in Europe. 90 per cent of her coal comes from the rich industrial area of Silesia, in which large centres are Katowice and Chorzow, and over 100 million tons are produced each year. Coal is Poland's chief export, and it brings in enough foreign currency to enable her to import goods which she lacks, or cannot produce in sufficient quantity herself.

Iron ore is also extensively mined in Silesia, and this enabled Poland to produce 7,234,000 tons of steel in 1961. Lignite, zinc, copper, lead, aluminium, and salt are all found within the Polish borders, and the production of all these is increasing each year. Poland also possesses large amounts of petroleum in Galicia.



ELECTRICAL ENERGY

The vast quantities of cheap, good-quality coal have enabled the production of electrical energy to double since 1945. It now stands at about 35 thousand million kilowatts per hour, and supplies an increasing proportion of Polish industry.

Thriving industries help Poland's economy





Agriculture

Agriculture plays an extremely important part in the Polish economy, and despite the great growth of industry in the last 15 years, more than one-third of the total population still earn their living from the land.

Most of the agricultural land is owned by individual peasants, although about one-eighth is owned and farmed directly by the state. The greater part of the land is devoted to arable production, and rye is the major crop, followed by oats, wheat, and barley. Potatoes are also grown extensively, and sugar beet cultivation is increasing rapidly.

Much land, especially in Silesia and Posen, is devoted to pasture and meadows. Livestock farming is a major part of Polish agriculture, and indeed 70 per cent of all food exports is made up of animal products – above all, bacon and pork.

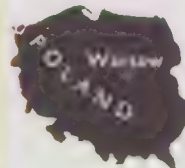
Much of Poland is covered by coniferous forests, and this has led to the development of a great timber industry, centring on Posen and Bydgoszcz. The easily available wood has also stimulated paper production, which provides another export for Poland.



A flock of grazing sheep; over one-third of the Poles make a living from agriculture

MAJOR EXPORTS

Coal, lignite, ships, food products (especially bacon and pork), cattle, and paper.



MAJOR IMPORTS

Iron ore, petroleum and its products, fertilisers, wheat, cotton, and food-stuffs.

INDUSTRIAL ACTIVITIES

Machinery, chiefly for the textile, agricultural, timber, and metal-working industries, is one of the most important products of the great industrial centres such as Warsaw, Breslau, Cracow, and Posen. Transport needs – railway engines, lorries, and tractors, for example – also stimulate industry.

The expanding chemical industry produces large amounts of sulphuric acid, artificial fibres, synthetic rubber, fertilisers, soap, and pharmaceutical products. Textile manufacture, especially of cotton and wool, is found in many parts, and other major industries include sugar refining, corn milling, manufacture of beer and spirits, and meat packing and canning.

Barges and steamers at Danzig, the great Polish port on the Baltic Sea



Part of Warsaw's nuclear research institute



FACTS AND FIGURES

Population: 30,500,000

Main towns:

Warsaw (capital):

1,200,000

Lodz: 708,400

Cracow: 479,000

Breslau: 429,200

Posen: 407,800

Danzig: 286,500

Main ports: Gdynia, Danzig, Stettin, Kolberg.

Merchant marine: 350 vessels over 100 tons (1962).

Main rivers: Vistula (Wisla), Oder (Ochra), Bug, Warta.

Currency: 1 zloty = 100 groszy.

PHILIP OF MACEDON

ATHENIANS, you fight against Philip like a barbarian in a boxing match. If he is hit on one side, he promptly clutches the place; then when he is hit on the other side, there go his hands. Could he fend off or avoid these blows? and how? He neither knows nor cares. And you are just like him. If you hear that Philip is in the Chersonese, you send help up there; if he is at Thermopylae, you rush there. Wherever he goes, you run to and fro after him, as if he were your commander rather than your enemy. . . .

These reproaches were aimed by Demosthenes at his fellow-Athenians in 351 B.C. The extract quoted here is part of a series of violent speeches in which he encouraged the Athenians to make a stand against Philip. Some of these speeches were known as the *Philippics*, from the name of the man who was their target. (Cicero's violent speeches against Mark Antony – see page 1009 – were also called *Philippics* after these speeches of Demosthenes.)

But who was this Philip of Macedon, who was capable of arousing such hatred and fury?



Great father of a famous son

Everyone has heard of Alexander the Great, the Macedonian ruler who conquered a vast empire between 336 and 323 B.C., and died when he was only 32 years old, sighing for other worlds to conquer (see page 756). But Alexander could never even have begun his conquests had it not been for the patient preparations of his father, Philip.

Philip II, King of Macedon, was a brilliant diplomatist and strategist who developed a new and formidable battle formation, the Macedonian *phalanx*. Over a period of more than 20 years he built up the power of Macedon, outwitted and defeated the city-states of Greece, and compelled them to unite against Persia under his leadership. Philip, although less



The Macedonian phalanx, developed by Philip. Enemy armies tried in vain to penetrate this mass of blades, to which Philip's decisive victory at Chaeronea was partly due

famous than his son, was nevertheless one of the greatest rulers of antiquity.

Philip, who was born in about 382 B.C., was the youngest son of Amyntas, King of Macedon. At that time Macedon was weak, divided and considered barbarian by the Greek city-states, who frequently interfered in Macedonian politics. Philip began his public career when only 14, soon after his father's death – as a prisoner! The king had been forced to hand him over to the Thebans as a hostage. The young prince lived in Thebes for three years. He came to know the Greeks well, and to admire them as warriors and as strategists. He learned so much from his stay there, in fact, that he was able to spend the rest of his life causing problems for his former masters.

Five years after his return to Macedon, Philip became its king. Although only 22 years old, he set about putting its affairs in order with a rapidity and efficiency that would have done credit to an experienced politician.

First he unified Macedonia by bringing its semi-independent principalities under his own control. Then, by skilfully playing off the principal Greek city-states against each other, he managed to incorporate in his kingdom the Greek cities on the northern shores of the Aegean – at Athens' expense.

Philip also gained control of the rich gold and silver mines on Mount Pangaeum. This gave him an assured source of wealth which he was to find very useful – not least when practising the art of bribery. He refounded a nearby city as a mining centre, and named it Philippi.

Meanwhile Philip was building up the Macedonian army into the formidable fighting force that was to make possible Alexander's great victories. Philip equipped his infantry with longer spears and smaller shields than was usual. He massed them into a great phalanx of several battalions that could drive back and pin down the enemy with a wall of spears, while his cavalry charged them from their flank or rear.

By this time Demosthenes at least had realised that Philip was a menace to the freedom of the independent city-states. These, by their rivalries and jealousies, were playing into his hands. Most of them were engaged on one side or the other in the Sacred War declared by Thebes against Phocis, which had seized the national shrine of Delphi. Eventually Thebes invited Philip, who had meanwhile been stirring up a revolt against Athens in Euboea, to intervene. Phocis was defeated, and Philip was given the Phocians' seat on the Amphietyonic Council (connected with the temples and their cults) in 346.

But by 340 Philip was at war with Athens. He marched south to attack her by land. Thebes joined Athens to resist him; but he defeated them decisively at Chaeronea (338). Summoning a congress of all the Greeks at Corinth, he proposed a federal union and an attack on Persia. But in 336, before this could be carried out, he was assassinated.

YOU SHOULD NOW KNOW

1. What were Demosthenes's diatribes against Philip called?
2. What was the name of the mining centre Philip founded?
3. What was a phalanx?
4. Why did Thebes declare war on Phocis?
5. When was Philip killed?

FLOWERING TIME



A whole forest of bamboos like these will sometimes all bloom together after perhaps 100 years without flowering

SOME kinds of bamboo flower in a most curious way. The plant grows for a period of many years, in a few cases for over 100 years, and then flowers. After this, all the leaves wither and fall, and soon after the plant dies. And more remarkable still, in some species all the plants over an area of hundreds of square miles grow slowly over a long period and then all flower together and die. It has also been found in some cases that cuttings taken from a clump of bamboo in one part of the world and planted thousands of miles away flower at the same time as the parent plant. In a case like this the explanation could be that their flowering time coincides because a plant grown from a cutting is really part of the same individual as its parent. The simultaneous flowering of different plants over a wide area is not so easy to explain, and it must be admitted that this periodic flowering of bamboos is not completely understood. Some species of the genus *Phyllostachys* in China and Japan flower periodically at intervals of over 100 years; the common Indian species *Bambusa arundinacea* blooms every 30 years or so.

In parts of Assam and Burma there are rats whose natural food is the shoots and leaves of a periodically flowering species of bamboo growing on the hillsides. These bamboos all flower and die together at intervals of many years; when they do so the rats are short of food and they descend in thousands into the valleys and devour the villagers' crops. In this way famines are caused for one or two years until the bamboo seedlings grow up, but they only occur once or twice in a man's lifetime.

THE TWO PHASES IN THE LIFE OF A PLANT



Peach tree in its vegetative phase

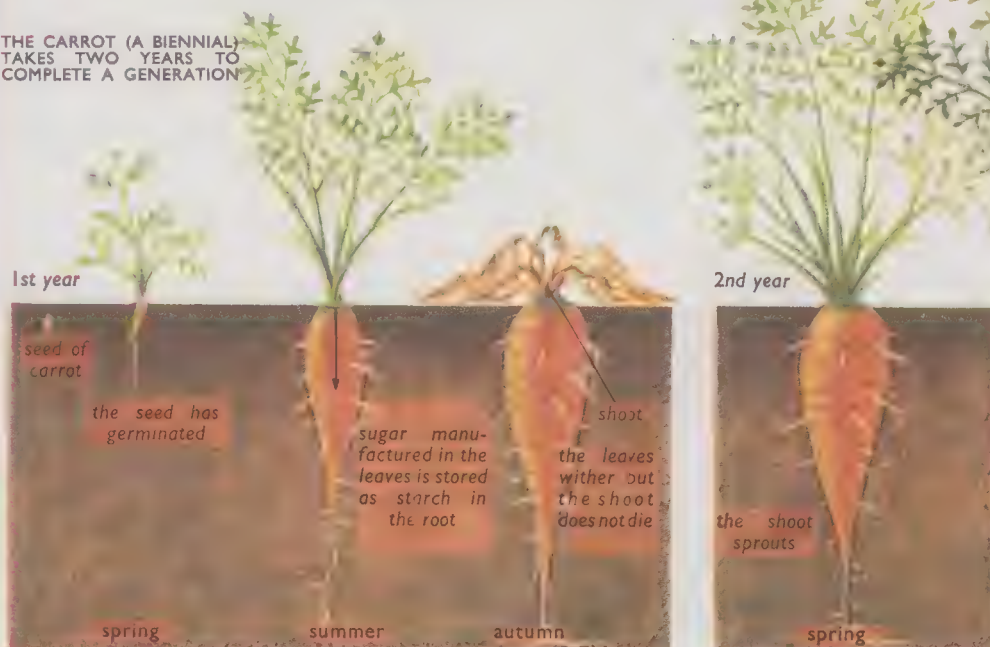
The same plant in its reproductive phase

Every plant passes through two periods or phases during its life – the vegetative phase and the reproductive phase. During the vegetative phase all of its growth and development appear to have one purpose, to make the individual a strong, efficient member of its species. In the reproductive phase the energy of the plant is directed towards propagation of the species; it may devote itself so completely to this end that it dies. In the reproductive phase plants bear flowers, which are the first stage in the production of fruit. After fertilisation of the ovule by cells from a pollen grain (see page 284) seeds develop in the fruit and subsequently grow to form a new generation of that particular kind of plant.

MONOCARPOUS AND POLYCARPOUS PLANTS

These two rather alarming words mean 'once-fruiting' and 'many-times-fruiting'. A monocarpous plant is one which flowers and has fruit only once in the course of its life; such plants as these are called annuals and biennials. The annuals – for example, peas and wheat – live for one season only, germinating, growing, flowering, and producing seeds within a year. Biennials, like carrots and cabbages, have a longer growing period and take two years to complete a generation. Polycarpous plants are those which live for a number of years, flowering repeatedly, usually every year.

THE CARROT (A BIENNIAL) TAKES TWO YEARS TO COMPLETE A GENERATION



In addition to annuals and biennials there is a third type of monocarpous plant which remains in its vegetative phase for a number of years, after which it flowers, ripens its seeds, and then dies. The agave or century plant (*Agave americana*) grows for six or seven years and then, in favourable conditions, sends up a very tall flower-bearing stem. When it is grown in conditions that do not suit it so well the plant may live for 50 years or more before flowering, but in any case it dies soon after its seed ripens. The name 'century plant' was given to it in the belief that it might live for a hundred years before flowering, but this is an exaggeration. Other species of agave, such as the sisal plant (*Agave sisalana*), have the same habit and, as we have seen, so do many bamboos. It is possible to prolong the lives of most of these plants simply by cutting back the flowering shoots as soon as they appear. It would seem that the 'effort' of flowering and producing seed completely exhausts the plant and causes it to die.

Polycarpous plants may be herbaceous perennials or woody plants like trees and bushes. Michaelmas daisies are typical herbaceous perennials. They spend the spring and most of the summer in the vegetative phase, flower in the late summer, and then the part above the ground dies down. Their underground parts live through the winter without any growth or activity and send up green shoots in the spring; this cycle may continue for a number of years. Perennials of this kind sometimes flower within a year of developing from seed, but the woody plants seldom do this. Many trees only start blooming after about 20 years of life, and some, like the oak and elm, are 50 or 60 years old before they flower.



Sisal plants (*Agave sisalana*), one of which is flowering



WHEN PLANTS FLOWER



A pine tree 20 years old may never have developed cones



A pine tree, dwarfed by being grown in insufficient soil, will bear cones when it is only a foot high

We all know that different plants flower at different times of the year: Christmas roses in February, primroses and most fruit trees in spring, asters in late summer and autumn. What makes a particular plant flower at a particular season? One experiment to make in this connection is to remove the plant from the seasonal changes to which it is accustomed. In Europe a cherry tree flowers in April and bears fruit soon afterwards. But if it is taken to a tropical country where the temperature is almost the same all the year round, it never flowers at all, nor do its leaves fall; it becomes a purely vegetative evergreen. Evidently the resting period brought about by the winter of a temperate climate is necessary for the production of flowers and fruit.

This establishes the fact that a plant must have seasons like those of its natural habitat if it is to bloom seasonally. But what controls the time of year at which a plant flowers? If it is an annual or biennial this will depend to a great extent on its stage of growth, since such plants flower only when they are mature, but the flowering time of perennial plants depends largely on the amount of light they receive.

The influence of light on flowering time has been closely studied, and it has been found that it is the length of time that the plant is exposed to light that matters rather than the strength or brightness of the light. Some plants, called 'long day plants', are stimulated to flowering by the lengthening of the days in spring; 'short day plants',

which bloom in late summer or autumn, flower when the length of the days is decreasing. The hours of daylight at a given latitude will be the same on any date, regardless of the weather. This is the reason why many plants flower according to the calendar, even when the season is unusually warm or cold, wet or dry.

Chrysanthemums are autumn-flowering short day plants; and if their hours of daylight are shortened earlier in the year by shading them for part of the day they will flower early. If they are given artificial light for part of the night, flowering will be postponed until later in the season. Since flowers out of their proper season often fetch a high market price, it may be well worth while to do this.



Bed of chrysanthemums still in bud

Below: these chrysanthemums in a greenhouse have flowered early because they have been shaded for part of each day



THE REIGN OF EDWARD VI

EDWARD VI was by far the least effective of the Tudors. This is not surprising, for when he came to the throne he was only nine and his short life was dogged by ill-health. His reign was therefore dominated by others – the members of the Privy Council appointed for him by his father, Henry VIII. This Council included the influential Earl of Warwick and Archbishop Cranmer, but excluded the Catholic bishops Gardiner and Bonner. At the start of Edward's reign the most important man was his uncle, the Earl of Hertford; he was immediately appointed Protector of the Realm and created Duke of Somerset in defiance of the late King's will (which had laid down that all members of this Council should be equal).

The rule of Somerset

Somerset was in some ways the most agreeable 16th-century ruler. He was sympathetic to the peasants and a man of high principles. But his lack of resolution proved fatal in an age when firmness was more appropriate than enlightenment.

Somerset's first action was to remove the one prominent Catholic, Chancellor Wriothesley. Then he turned his attention to the war he had inherited with Scotland. In September 1547 he crossed the border and won the decisive battle of Pinkie. With this triumph behind him Somerset returned to London to deal with the problem of religion. In November he repealed most of Henry's treason and heresy laws, including the 'catholic' Six Articles (see page 1710), and the same year passed an act dissolving the chantries – one further step along the road to secularising (seizing for the State) Church property.

Somerset, like Edward, was a devout Protestant. Continental reformers arrived in great numbers. In June 1548 Bishop Gardiner was sent to the Tower, while in 1549 came Cranmer's first English Prayer Book. The Prayer Book precipitated a crisis in conservative Cornwall. The Cornish rebelled; and simultaneously came Kett's revolt in Norfolk. Kett's grievances were economic, not religious. He and his followers felt sure that Somerset (who in 1548 had ordered a commission to enquire into agrarian discontent over the enclosure of common land) would help them against the landowners.

Both revolts were crushed, but Somerset played little part. Ominously the Earl of Warwick gained a great reputation for suppressing the Norfolk rising. Somerset had proved himself

inefficient, and hostility grew. He was attacked both by those who hated his 'liberalism' and by those who supported Warwick as a 'strong man'. In October 1549 Somerset was arrested by a conservative faction, but the following February Warwick overthrew this faction and released Somerset. He could afford to; he had ingratiated himself with the King and now dominated King and Council. Yet while Somerset lived Warwick could not enjoy complete power. In 1551 Warwick was suddenly promoted to the Dukedom of Northumberland, and Edward, now of age, was introduced to the Council. In October Somerset was arrested and in February 1552 died on the scaffold – for treason.

The rule of Northumberland

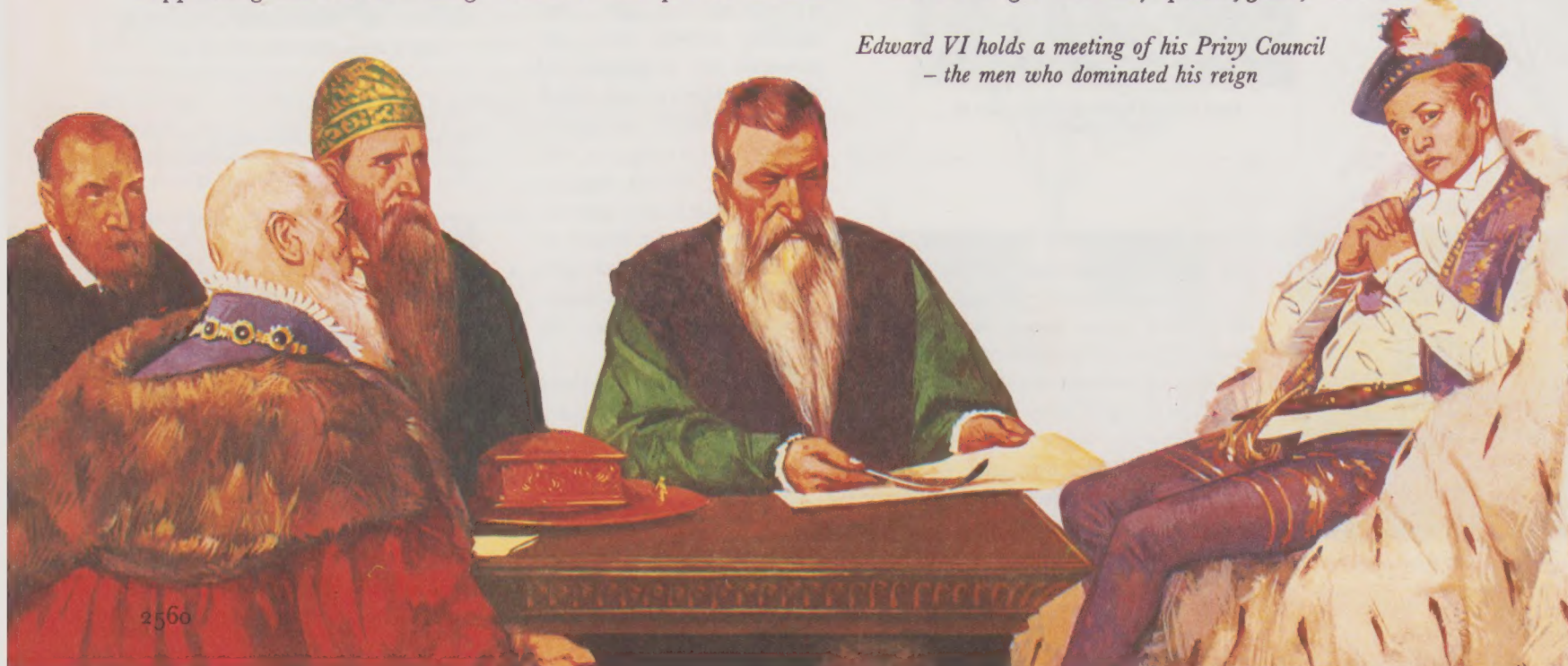
Northumberland was totally different from Somerset. Cruel, ruthless, and intriguing, he used his influence with the King to bend the nation to his will. Yet his rule was an improvement on Somerset's. His government, through the Lord Treasurer, Sir William Paulet, tackled administrative inefficiency. He also attempted to rectify the damage caused by the rise in prices resulting from the numerous coinage debasements of Henry VIII and Somerset.

Northumberland's attitude to religion is an enigma. On his deathbed he declared that he had always been a Catholic, yet in fact he actively encouraged Cranmer (and Edward) to 'protestantise' the settlement of 1549. In 1550 the strongly Protestant Hooper and Ridley were given important bishoprics. In 1552 came the revised or second Prayer Book which was accompanied by an Act of Uniformity making it the only legal form of worship. In 1553 came Cranmer's 42 Articles which made no concessions to Catholicism.

Suddenly, unexpectedly, this process came to an abrupt halt. The King's health had never been good; in the spring of 1553 a severe cold, following measles and smallpox, brought him to his deathbed at the age of 15. His legitimate successor was the fanatical Catholic, Mary Tudor. Northumberland had to act fast; so he persuaded the dying Edward to bestow the crown not on Mary but on his own daughter-in-law, Lady Jane Grey, a descendant of Edward's Aunt Mary.

Edward died on 6th July 1553. On the 10th Queen Jane was proclaimed in London, but Queen Mary, who had fled to Norfolk, was proclaimed there. Support rallied to the legitimate sovereign, the daughter of Henry VIII; Northumberland's desperate plot was doomed. His last gamble was a *volte face* – an enthusiastic recognition of Mary. But it was no good. Both he and the tragic 'nine-day queen', Jane, were executed.

*Edward VI holds a meeting of his Privy Council
– the men who dominated his reign*



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the Upper Palaeozoic corals and molluscs were still abundant. Many land plants appeared in the Carboniferous period, growing in large swamps and lagoons. Simple coiled creatures called ammonites appear in the Devonian and become more complicated in the Permian. The Permian fauna of eastern England is that of an inland sea and so is limited. The land fauna included primitive reptiles (see far right).



One of the great swamps of the Carboniferous Period



Primitive fish of the Silurian Period



Large reptile of the Permian Period

MESOZOIC ERA (from the Greek *mesos*, middle, and *zoe*, life)

The Mesozoic or Secondary Era is the era of the reptiles.

Duration: 120 million years.

Periods:

Triassic or *Trias* (190 m ago) – this is found at its most typical in Germany.

Jurassic (150 m) – takes its name from the Jura Mountains of eastern France.

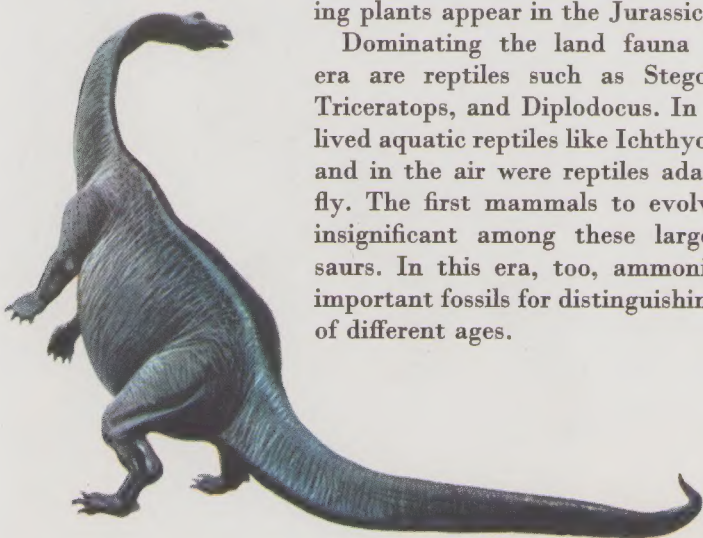
Cretaceous (120 m) – takes its name from the Latin *creta*, chalk – an earthy white limestone which contains nodules of flint.



Land and sea in the Cretaceous Period

Geographical distribution: The sandy Triassic deposits were laid down in a desert climate. The Jurassic and Cretaceous rocks, which were laid down on a gently subsiding sea floor, now form the Cotswold and Chiltern Hills respectively and underlie all south-east England.

Large dinosaur of the Triassic Period



Flora and fauna: The plants of the Mesozoic Era include cycads, conifers, ferns, and horsetails. The ginkgo or maiden-hair tree and the earliest flowering plants appear in the Jurassic.

Dominating the land fauna of this era are reptiles such as *Stegosaurus*, *Triceratops*, and *Diplodocus*. In the sea lived aquatic reptiles like *Ichthyosaurus*, and in the air were reptiles adapted to fly. The first mammals to evolve were insignificant among these large dinosaurs. In this era, too, ammonites are important fossils for distinguishing rocks of different ages.

CENOZOIC ERA (from the Greek *cainos*, recent, and *zoe*, life)

In the Cenozoic or Tertiary Era modern life forms developed.

Duration: 69 million years.

Periods:

Eocene (70 m ago) – from the Greek *eos*, dawn, and *cainos*, recent.

Oligocene (50 m) – from the Greek *oligos*, few, and *cainos*, recent.

Miocene (35 m) – from the Greek *meion*, minority, and *cainos*, recent.

Pliocene (15 m) – from the Greek *pleion*, majority, and *cainos*, recent.

The last three names refer to the number of species of molluscs alive today found fossilised in rocks of these periods.

These periods are represented in England by sediments in the London and Hampshire Basins, and in Northern Ireland by basaltic lavas. Mountain building convulsions, occurring in the Miocene period, thrust up the Alps and Himalayas and affected southern England, especially the Isle of Wight.



Land and sea in the Pliocene Period

Flora and fauna: The highest division of the Angiosperms (flowering plants) became abundant, and in cold areas fossils are found of other plants which still survive in tropical climates. None of the gigantic reptiles of the Mesozoic survived, and mammals and bony fishes developed and became abundant. Single-celled creatures called Nummulites are found in great numbers in early Cenozoic rocks. Below are some Cenozoic mammals:

① *Miacis*, an ancestor of the dog and bear; ② *Eohippus*, an ancestor of the horse; ③ *Machairodus*, the sabre-toothed tiger; ④ *Palaeomastodon*.



NEOZOIC ERA (from the Greek *neon*, new, and *zoe*, life)

It was in the Neozoic or Quaternary Era that man developed.

Duration: 1 million years.

Periods:

Pleistocene (1 m ago) – from the Greek *pleistos*, most, and *cainos*, recent. This is the glacial period, when a large area in the northern hemisphere, including North America and northern Europe (see map below), was covered by ice. The Pyrenees, Alps, and Caucasus also had small ice caps. Remnants of these ice caps are seen in the glaciers of Switzerland, Norway, and Alaska. The Pleistocene included at least four major glaciations with warmer intervals between, known as interglacial episodes. Evidence for the glaciations is found in the mountains where there are ice-eroded valleys, and on the lowlands where the ice has deposited boulder clay and terminal moraines.

Holocene (0.025 m) – from the Greek *olos*, complete, and *cainos*, recent. This is the post-glacial period in which we are now living. At the beginning of the period much finely ground rock material left by glaciers of the Pleistocene was blown into central Europe where it formed the *loess* deposits of central Europe and southern Russia. The deposits (alluvium) of most rivers have been laid down during the Holocene period, which began about 25,000 years ago.

EUROPE DURING THE PLEISTOCENE GLACIATIONS



Flora and fauna: During the glacial and interglacial episodes plant and animal life gradually moved south to avoid the cold. Many species of plants such as the sequoias and magnolias were driven out of Europe, never to return naturally. But as the climate grew milder and the glaciers finally melted, many plants colonised farther and farther north until they reached their present positions. By the end of the Pleistocene many of the larger mammals such as the mammoth and hairy rhinoceros had become extinct. About the same time creatures increasingly like

◀ Present-day glacier in Alaska

man and less like apes evolved. One of these was Neanderthal man who lived in caves in Germany. As shown in the pictures below, it has been possible to reconstruct the appearance of both early man and his contemporary animals from fossil bones.

